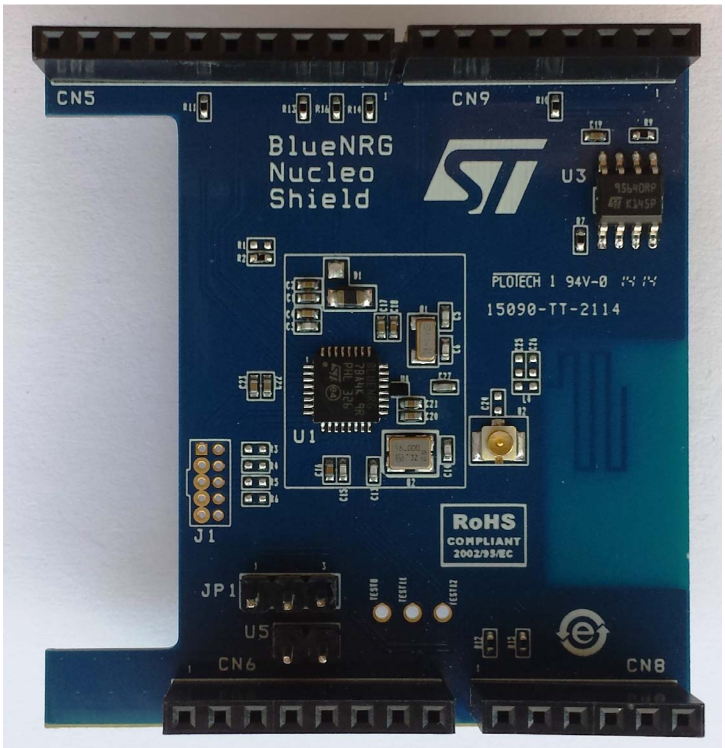
UM1765
User manual

X-NUCLEO-IDB04A1 Bluetooth low energy expansion board based on BlueNRG for STM32 Nucleo

Introduction

This document provides detailed hardware requirements and board connections for the X-NUCLEO-IDB04A1 Bluetooth® low energy (BLE) evaluation board based on BlueNRG for STM32 Nucleo. This board is part of STMicroelectronics' offering of evaluation boards designed around the BlueNRG Bluetooth low energy wireless network processor.

Figure 1. X-NUCLEO-IDB04A1 evaluation board



Other BlueNRG evaluation boards are available in the following kits:

- STEVAL-IDB002V1: BlueNRG development platform
- STEVAL-IDB003V1: BlueNRG USB dongle

Contents

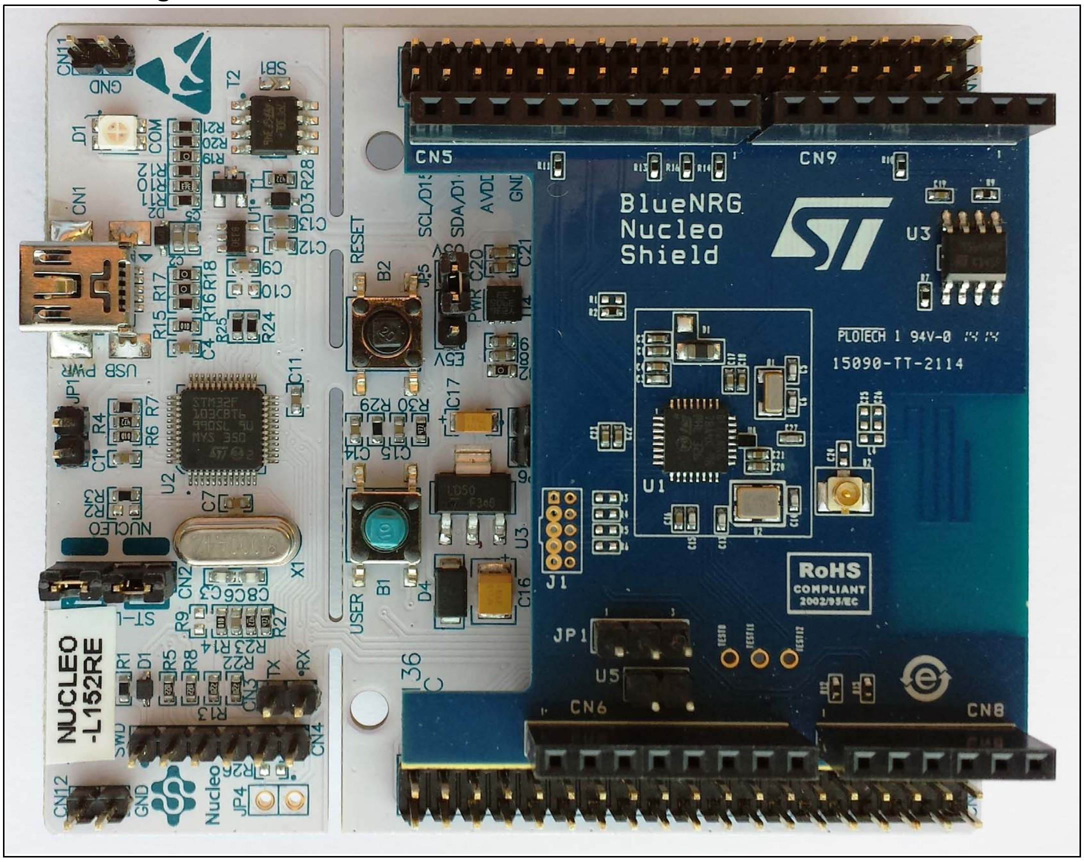
1 Getting started

This section describes the hardware requirements for the X-NUCLEO-IDB04A1 evaluation board.

1.1 Hardware requirements

The X-NUCLEO-IDB04A1 is an expansion board for use with STM32 Nucleo boards (please refer to UM1724 on www.st.com for further information). To function correctly, the STM32 Nucleo board must be connected to the X-NUCLEO-IDB04A1 board as shown in *Figure 2* below.

Figure 2. X-NUCLEO-IDB04A1 connected to STM32 Nucleo board



The interconnection between the STM32 Nucleo and the X-NUCLEO-IDB04A1 has been designed to permit the use of any STM32 Nucleo board, although the optimal combination is obtained using the NUCLEO-L152RE or NUCLEO-L053R8 hosting the ultra-low power STM32.

1.2 System requirements

Using the Nucleo boards with the X-NUCLEO-IDB04A1 expansion board requires the following software and hardware:

- a Windows PC (XP, Vista, 7, 8) to install the software package
- a USB type A to Mini-B USB cable to connect the Nucleo to the PC

Installation of the board firmware package (order code: STSW-IDB04V1) and the BlueNRG graphical user interface utility on the user's PC requires the following:

- At least 128 MB of RAM
- 40 MB of hard disk space available

The STSW-IDB04A1 firmware and related documentation is available on st.com at http://www.st.com/web/en/catalog/tools/FM116/SC1075/PF260517.

2 Hardware description

This section describes the X-NUCLEO-IDB04A1 features and provides information which could be useful for understanding the board schematics.

2.1 X-NUCLEO-IDB04A1 board

The board allows the user to test the functionality of the BlueNRG processor. It hosts the innovative BALF-NRG-01D3 balun & harmonic filter and its functionality can be exploited using the firmware package contained in the STSW-IDB04V1. It is fundamental to program the microcontroller on the STM32 Nucleo board. Please refer to user manuals UM1724 and UM1725, available on www.st.com.

The BlueNRG processor and the STM32 Nucleo board are connected through connectors CN5, CN6, CN8 and CN9 (see *Table 1* for details). The pins indicated with an asterisk (*) represent an alternative pin for that specific function, i.e. SPI_IRQ could be moved from CN8.1 to CN5.2.

Table 1. Interconnection between STM32 Nucleo board and X-NUCLEO-IDB04A1

		NC	IOREF	RESET	3V3	5V	GND	GND	VIN		A0	A1	A2	A3	A4	A5	
Left connectors																	
		1	2	3	4	5	6	7	8		1	2	3	4	5	6	
					3V3		GND	GND			SPI_IRQ	SPI_CSN					
D15	D14	AREF	GND	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Right connectors																	
CN5 digital										**CN9 digital**							
10	9	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
			GND	SPI_CLK*	SPI_MISO	SPI_MOSI		SPI_IRQ*	SPI_MCSN	BNRG_RST				SPI_CLK			

To change the default pin SPI_CLK and SPI_IRQ, the user must disassemble, respectively, R10 and R12, and assemble R11 and R16.

The board also includes:

- a high frequency 16 MHz crystal
- a low frequency 32 kHz crystal for lowest power consumption
- a BALF-NRG-01D3 balun & harmonic filter
- an EEPROM M95640 to store the board parameters

Not mounted:

- a JTAG connector to program the BlueNRG processor
- an SMA connector for the external antenna

2.1.1 Current measurements

To monitor the power consumption of entire BlueNRG X-NUCLEO-IDB04A1 board, jumper U5 can be used, inserting an ammeter probe between pins 1 and 2 of the connector. Since the power consumption of BlueNRG during most of its operating time is very low, an accurate instrument in the range of few microamps may be required.

3 List of acronyms

Table 2. List of acronyms used in the document

Term	Meaning
BLE	Bluetooth low energy
USB	Universal serial bus

4 Board schematic and bill of material

Table 3. Bill of materials (part 1)

Item	Quantity	Reference	Part	Note
1	4	C1, C17, C20, C22	1u_0402_X5R	VBAT & SMPS OUT filter cap
2	6	C2, C16, C18, C19, C21, C23	100n_0402_X7R	VBAT filtering
3	2	C3, C15	100p_0402_C0G	VBAT filtering
4	1	C4	150n_0402_X5R	VREG filtering
5	2	C5, C6	22p_0402_C0G	32 kHz XTAL load cap
6	1	C27	56p_0402_C0G	TX/RX balun cap
7	1	C24	56p_0402_C0G	TX/RX bypass cap
8	1	C25	TBD_0402_COG	Tuning cap
9	1	C26	TBD_0402_COG	Tuning cap
10	1	L4	TBD_0402	Tuning cap
11	2	C13, C14	15p_0402_C0G	16 MHz XTAL load cap
12	1	D1	Soldered between pins 1 and 2	SMPS out inductor
13	1	JP1	HEADER 1X3	Male strip 1X3, 100 mils
14	1	J1	THR 1.27 mm 2x5 pins	Test connector
15	1	J2	RF_IN/OUT	UFL jack assembly, End Launch
16	1	U4	BALF-NRG-01D3	Integrated balun for BlueNRG QFN32
17	1	CN5	Extra-long 10 pins female-male strip	Female side mounted to the top
18	2	CN6, CN9	Extra-long 8 pins female-male strip	Female side mounted to the top
19		CN8	Extra-long 6 pins female-male strip	Female side mounted to the top
20	1	Q1	XTAL	XTAL
21	1	Q2	XTAL	XTAL

Table 3. Bill of materials (part 1) (continued)

Item	Quantity	Reference	Part	Note
22	5	R1, R3, R4, R5, R6		Connect to V_{DD}, pull-down
23	1	R2	10k_0402	Connect to ground
24	2	R7, R9	100k_0402	Pull-up and pull-down
25	4	R10, R12, R14, R15	0_0402	jumper-resistor
26	3	R11, R13, R16	0_0402	jumper-resistor
27	1	U1	BlueNRG	RF IC
28	1	U5	HEADER 1X2	Male strip 1X2, 100 mils
27	1	U3	EEPROM	Memory
28	3	TEST8, TEST11,TEST12	Test point	Test point

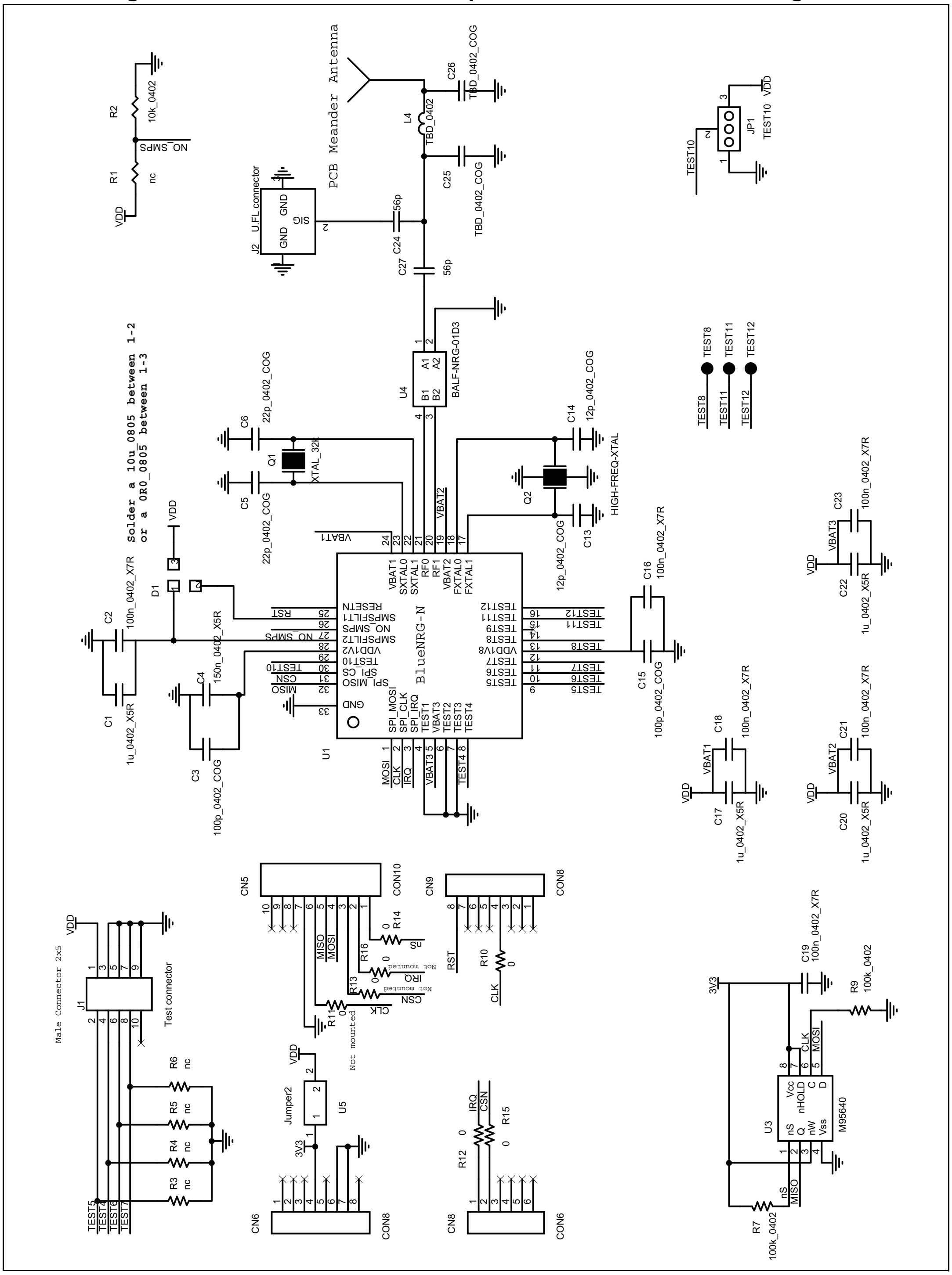
Table 4. Bill of materials (part 2)

Item	Package	Manufacturer	Manufacturer's ordering code / orderable part number	+8 dBm
1	SM/C_0402	Murata	GRM155R61A105KE15	1 uF
2	SM/C_0402	Murata	GRM155R71C104KA88	100 nF
3	SM/C_0402	Murata	GRM1555C1H101JZ01	100 pF
4	SM/C_0402	Murata	GRM155R61A154KE19	150 nF
5	SM/C_0402	Murata	GRM1555C1H220JZ01	22 pF
6	SM/C_0402	Murata	GRM1555C1H560JA01	56 pF
7	SM/C_0402	Murata		NE
8	SM/C_0402	Murata	GRM1555C1H120JZ01	1.2 pF
9	SM/C_0402			NE
10	SM/C_0402	Murata	GRM1555C1H180JZ01	1.8 pF
11	SM/C_0402	Murata	GRM1555C1H150JZ01	15 pF
12	SM/L_0805	Murata	LQM21FN100M70L	10 uH
13	WALCON.100/VH/TM2 OE/W.325/10/MOD			
14		SAMTEC	FTSH-105-01-F-D-K	NE

Table 4. Bill of materials (part 2) (continued)

Item	Package	Manufacturer	Manufacturer's ordering code / orderable part number	+8 dBm
15	SMT	Hirose	U.FL-R-SMT-1(10) Digikey H11891CT-ND	NE
16		STMicroelectronics	BALF-NRG-01D3	
17	2.54 mm pitch	4UCON	18688	
18	2.54 mm pitch	4UCON	18688	
19	2.54 mm pitch	4UCON	18688	
20	NX3215SA	NDK	NX3215SA-32.768kHz-EXS00A-MU00003	32.768 kHz
21	XTAL_32_25_REV2	NDK	NX3225SA -16.000MHz-EXS00A-CS05997	16 MHz
22	SM/R_0402	Tyco Electronics		NE
23	SM/R_0402	Tyco Electronics		10 k
24	SM/R_0402	Tyco Electronics		100 k
25	SM/R_0402	Tyco Electronics		0 Ohm
26	SM/R_0402	Tyco Electronics		NE
27	QFN32	STMicroelectronics		
28	WALCON.100/VH/TM2 OE/W.325/10/MOD			
27	SO8N	STMicroelectronics	M95640-RMN6	
28	TP			NE

Figure 3. X-NUCLEO-IDB04A1 expansion board schematic diagram



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
16-May-2014	1	Initial release.